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Colpoma guadueticola sp. nov. in a guadual forest from Quindio Department, Colombia

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Abstract—*Colpoma guadueticola* is described as a new species growing on fallen culms of *Guadua angustifolia* from Colombia. The specimens were collected in a guadual forest from the Natural Reserve 'La Montaña del Ocaso', municipality of Quimbaya, Quindio Department, Colombia. A key to the species of *Colpoma* is presented.

Key words—*Leotiomycetes, Rhytismatales, Rhytismataceae*, taxonomy

Introduction

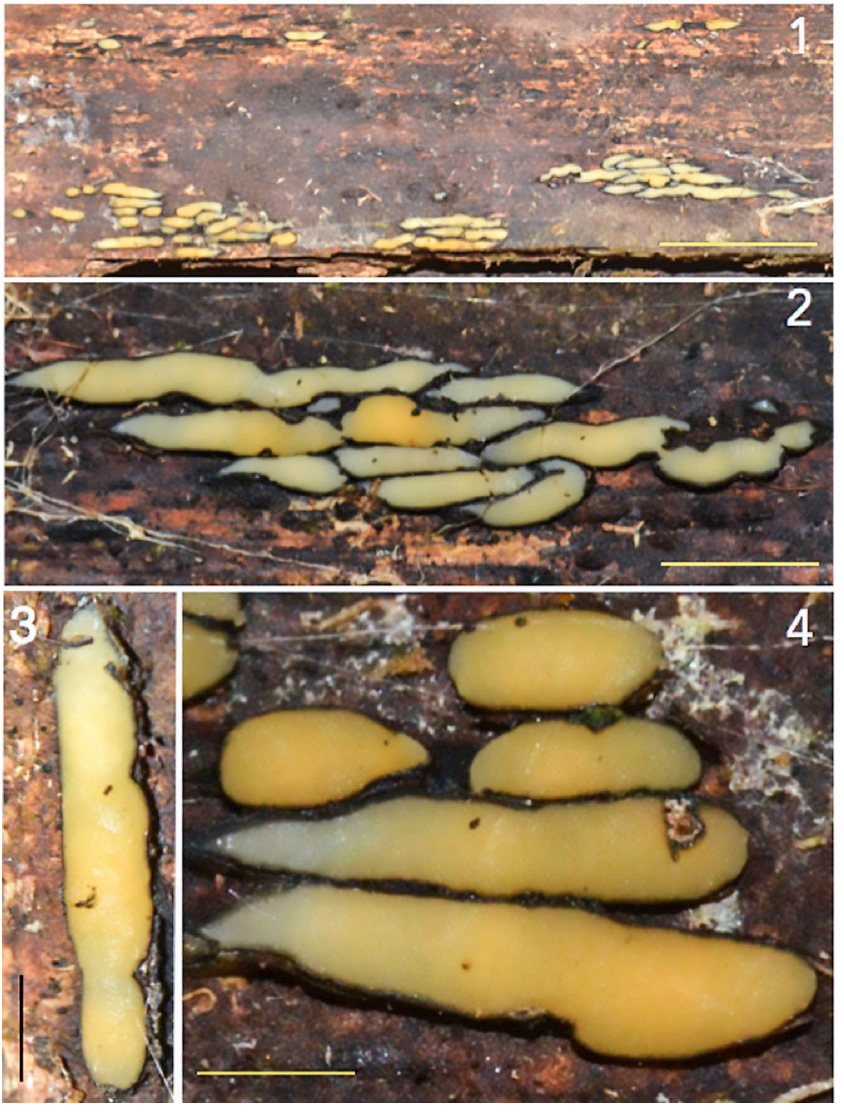
Colpoma was described by Wallroth in 1833 with *C. quercinum* (Pers.) Wallr. as the type species (Darker 1967). The ascomycete genus is characterized by its elongated (often curved) or ellipsoid apothecial ascomata that erupt under periderm or break through naked wood and open with a single longitudinal slit, well developed thick dark colored covering and basal layers, abundant slender paraphyses that often coil or bend at the tip, and continuous cylindric or filiform ascospores (Darker 1967, Johnston 1991). Quélet placed *Colpoma* within *Patellariaceae* (*Hysteriales*), a family later transferred to *Phacidiales* by Saccardo (Theon 1918). Darker (1967) moved *Colpoma* to *Hypodermataceae* (*Phacidiales*) after which Sherwood (1979) and Johnston (1991) transferred the genus to *Rhytismataceae* (*Phacidiales*). Currently, Medardi (2002, 2004) and Kirk et al. (2008) include *Rhytismataceae* within *Rhytismatales*.

The Natural Reserve 'La Montaña del Ocaso' is located at 4°34′08′′N 75°51′03′′W, south of Quimbaya municipality in Quindio Department, Colombia (Agudelo & Gómez 2001). The guadual forest of this natural reserve is a floristic resource of great ecological importance because of the huge diversity of plants, animals, and fungi. The forest is dominated by *Guadua angustifolia* Kunth (*Poaceae*), known as "Colombian bamboo" and considered the world's third largest bamboo, reaching heights up to 30 meters (Agudelo & Gómez 2001, Moreno et al. 2007).

There are few studies on fungal species associated with *Guadua angustifolia* in Colombia. Restrepo-F. et al. (2005) isolated four agaricomycete genera on *Guadua: Pleurotus* spp., *Schizophyllum commune* Fr., *Daedaleopsis tricolor* (Bull.) Bondartsev & Singer, and *Polyporus* sp. Soto-Agudelo et al. (2016a) described 29 ascomycete species collected in a guadual forest from the Natural Reserve 'La Montaña del Ocaso' from Colombia; of these, 15 grew on decayed debris of *Guadua angustifolia*, ten were found on decayed wood of trees, and four were parasites of other ascomycetes. In 2015 and 2016, during an ongoing survey of *Ascomycetes* in Colombia (Soto-Agudelo et al. 2016a,b), three *Colpoma* specimens were gathered from *Guadua angustifolia*. These collections had a distinct morphotype that could not be satisfactorily accommodated in any of the known species of this genus. The objective of the present work is to describe these specimens as a new species of *Colpoma* associated with *Guadua angustifolia* in the Department of Quindio in Colombia.

Materials & methods

The specimens were collected in The Natural Reserve 'La Montaña del Ocaso'in October 2015 and May 2016 and are deposited in the herbarium of the University of Quindío, Armenia, Colombia (HUQ) and in the fungal collection 'Dr. Gastón Guzmán Huerta' at the Herbarium Escuela Nacional de Ciencias Biológicas of Instituto Politécnico Nacional, Mexico City, Mexico (ENCB). Latitude/longitude coordinates were obtained with GPS eTrex (Garmin). Colors are coded according to Kornerup & Wanscher (1978). Morphological examinations were conducted using protocols outlined by Johnston (1991) and Minter (1997). Anatomical characters were measured from rehydrated tissues in 5% aqueous KOH and Melzer's reagent. Macroscopic characters were photographed with a Nikon D7000 and micrographs were taken with a Nikon Coolpix 9000. The meanings of some terms are based on Ulloa & Hanlin (2012) dictionary.



Figs 1–4: *Colpoma guadueticola* (isotype, ENCB Raymundo 5898). 1. Gregarious linear apothecia on fallen culm. 2. Mature fusiform, curved, sigmoid, sinuous to undulate apothecia with rounded or acute ends. 3. Elongated apothecium with rounded ends. 4. Apothecia ellipsoid, elongated, lacrymoid with rounded or acute ends. Scale bars: 1 = 10 mm; 2 = 3 mm; 3, 4 = 1 mm.

Taxonomy

Colpoma guadueticola Raymundo, Soto-Agudelo & R. Valenz., **sp. nov.** Figs 1–15

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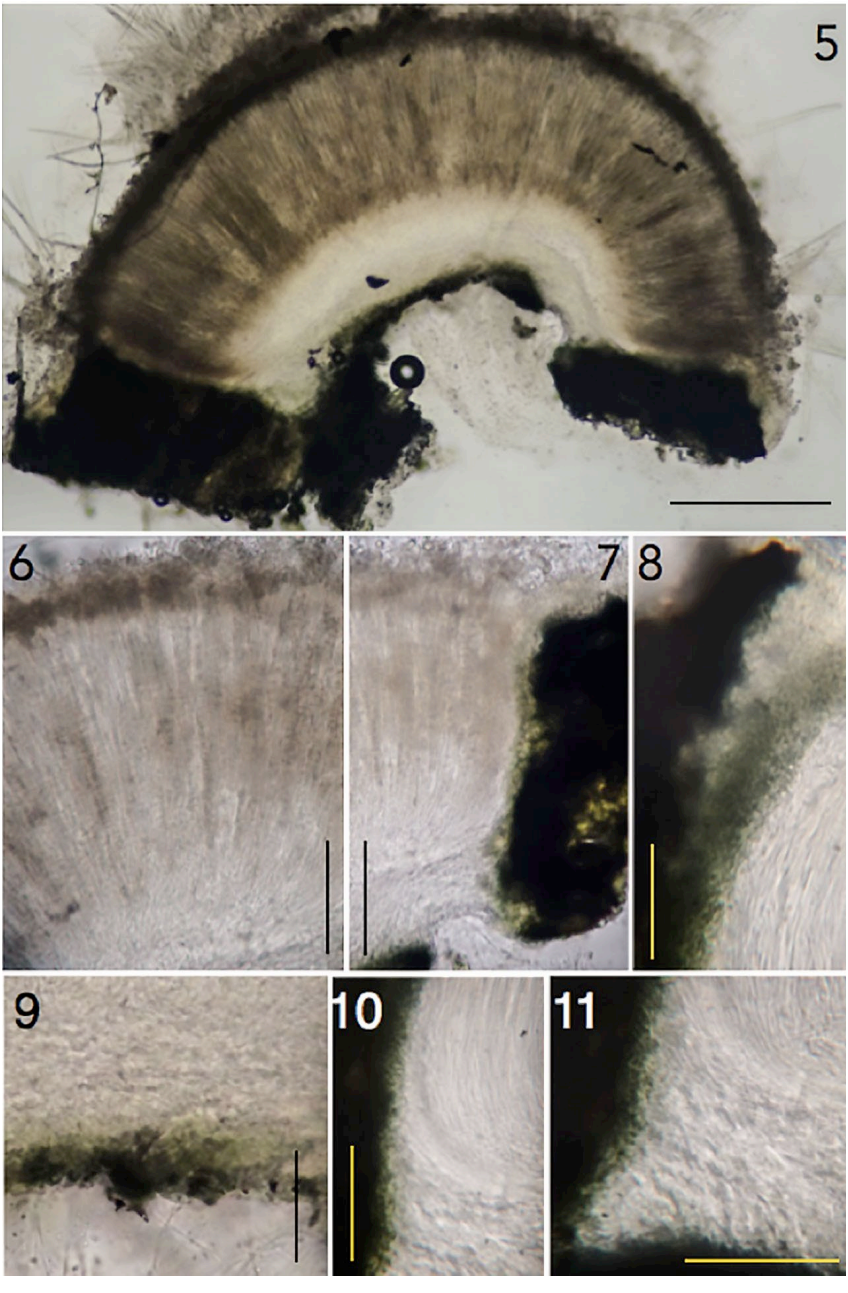
Differs from *Colpoma quercinum* by its long, filiform ascospores, its paraphyses dichotomically to irregularly branched at the apex, and its substrate of fallen culms of *Guadua angustifolia*.

Type: Colombia, Quindio department: municipality of Quimbaya, Natural Reserve 'La Montaña del Ocaso', 4°34′08″N 75°51′03″W, alt. 1050 m, 29 October 2015, T. Raymundo 5898 (**Holotype**, HUQ; **isotype**, ENCB).

Etymology: Referring to *Guaduetum*, the phytosociological name for the guadual forest dominated by *Guadua angustifolia*, where the specimens were collected.

Apothecia (1–)2–10 mm long and 0.4–0.8 mm broad, stromatic, erumpent, deeply immersed within substratum, and aligned with the main axis of the fallen culm; visible initially as small ellipsoid to oblong or linear black spots when closed, later opening by one longitudinal split, variable in shape when mature: ellipsoid, oblong, fusiform, curved, sigmoid, lacrymoid, sinuous to undulate, rounded or acute at both ends; the apothecial wall mostly covered with black stromatic tissue. Hymenium slightly raising the substratum surface, yellowish white (4A2) to pale yellow (4A3) in young specimens or at the edges and ends of the ascomata, light yellow (4A5) to deep yellow (4A8) in mature fresh specimens. Stromatic tissue in vertical transverse section covering the lateral sides and the lower part of the apothecia, lateral walls 60–100 µm thick, forming a textura angularis, dark brown to black in KOH, comprising mostly angular cells, olivaceous green to black, slightly thick-walled 5–9 µm diam.; lower wall 30–40 µm thick, forming a textura angularis, dark brown in KOH, comprising mostly angular cells, olivaceous green to brown, slightly thick-walled, 5–7 µm diam. Medullar excipulum 30–50 µm thick, forming a textura intricata with interwoven hyphae, hyaline in KOH, septate, 1–2 µm diam. Subhymenium 8–12 µm thick, forming a textura intricata, interwoven hyphae hyaline in KOH, 1–2 µm diam. Paraphyses filiform, hyaline in KOH, non-septate, smooth, thin walled, dichotomously to irregularly branched at the apex, extending up to 20 µm beyond the asci, 1–2 µm diam. Asci 136–180 × 5–7 µm, cylindrical,

Figs 5–11: *Colpoma guadueticola* (isotype, ENCB Raymundo 5898). 5. Apothecium, vertical transverse section. 6. Hymenium. 7. Medullary excipulum, hymenium, and stromatic tissue. 8. Lateral stromatic tissue with textura angularis. 9. Basal stromatic tissue. 10–11. Basal and lateral stromatic tissue and medullary excipulum. Scale bars: 5 = 300 µm; 6 = 80 µm; 7 = 100 µm; 8 = 40 µm; 9, 10 = 50 µm; 11 = 20 µm.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8-spored, hyaline in KOH, uniformly thin-walled, with only one wall layer visible, rounded apex, inamyloid. Ascospores parallel to subparallel within the ascus, (68–)80–110(–120) × 0.8–1.0 µm, filiform, straight to slightly curved, hyaline in KOH, aseptate, thin-walled, smooth, gelatinous sheath not observed at the apex.

Ecology & distribution—Gregarious on fallen and dead culms of *Guadua angustifolia* in guadual forest mixed with tropical dry forest. The species is known only from the type locality.

Additional specimens examined—**COLOMBIA**, **Quindio department: Municipality of Quimbaya,** Natural Reserve 'La Montaña del Ocaso', 4°34′08″N 75°51′03″W, alt. 1050 m, 29 October 2015, R. Soto-Agudelo 60 (HUQ); 17 May 2016, T. Raymundo 6036 (HUQ).

Comments—*Colpoma guadueticola* is characterized by its variably shaped apothecia with pointed or rounded ends, yellow hymenium, paraphyses that are dichotomously to irregularly branched at the apex, long straight to slightly curved aseptate ascospores, and its host *Guadua angustifolia*.

Colpoma azaleae (Schwein.) Cooke, *C. morbidum* (Peck) Sacc., *C. quercinum,* and *C. styriacum* Remler resemble *C. guadueticola* in having ascospores longer than 70 µm, but *C. azaleae* is separated by its small (1–3 mm long) apothecium, dark subrufescent hymenium, and *Rhododendron periclymenoides* (*Ericaceae*) substrate; *C. morbidum* is distinguished by its white to gray hymenial surface and growth on *Picea mariana* (*Pinaceae*) and *Chamaecyparis thyoides* (*Cupressaceae*); *C. quercinum* has roughly circular to oblong apothecia, apices of the paraphyses developing curls and spirals, and growth on *Quercus* spp.; and *C. styriacum* is separated by its small oblong yellowish green apothecia, 7–8-septate ascospores, and growth on *Vaccinium myrtilloides* (*Ericaceae*). The other *Colpoma* species are separated by their shorter (≤75 µm) ascospores and different hosts, as shown in the key below.

Key to the species of *Colpoma*

1. Ascospores ellipsoid to oblong-elliptical, 5–10 µm diam., 0–3-septate **2**
1. Ascospores filiform, 1–3 µm, diam., 0–8-septate **3**
2. On fallen bark of *Agathis australis*
(apothecia 0.6–1 × 0.3–0.5 mm, broad ellipsoid to oval, hymenial surface

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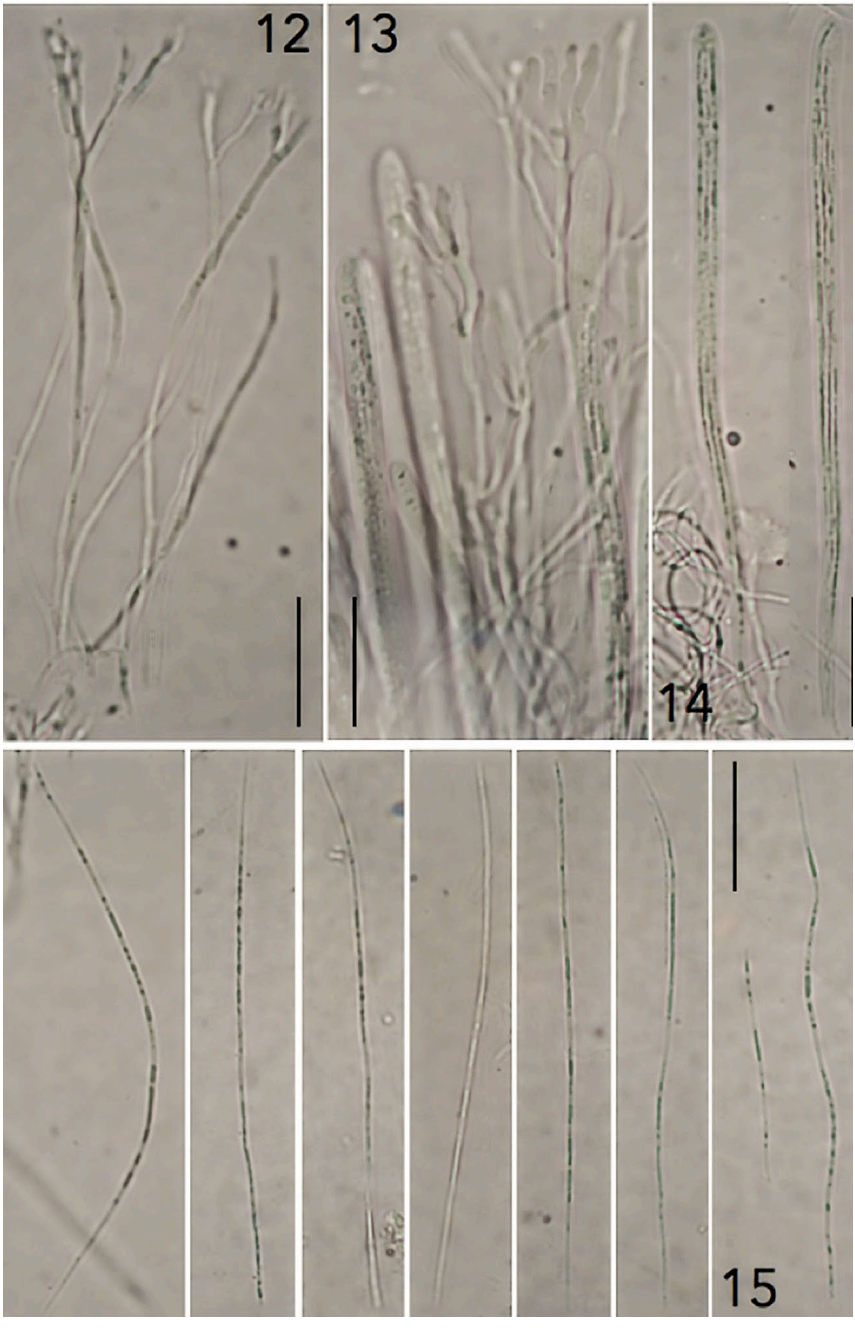
Figs 12–15: *Colpoma guadueticola* (isotype, ENCB Raymundo 5898). 12. Paraphyses dichotomously to irregularly branched at the apex. 13. Asci and paraphyses. 14. Asci with parallel to subparallel ascospores. 15. Ascospores. Scale bars: 12, 14 = 30 µm; 13, 15 = 25 µm.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yellow to orange, ascospores 17–25 × 5–7.5 µm, ellipsoid, (0–)1 septate; known only from New Zealand; Johnston 1991: 405) . . . . . ***C. agathidis***

2. On fallen wood of *Nothofagus*
(apothecia 1.5–5 × 1–2.5 mm, ellipsoid to irregular in shape, hymenial surface translucent yellow, ascospores 31–46 × 6–10 µm, ellipsoid, (0–)3-septate; known only from New Zealand; Johnston 1991: 407) . . ***C. nothofagi***

3. Ascospores ≤75 µm long **4**

3. Ascospores >75 µm **14**

4. On conifers **5**

4. On angiosperms **10**

5. On *Cupressaceae*
(on living and dead branches of *Juniperus communis*, apothecia 1–3 × 1–2 mm, circular, ellipsoid to irregular in shape, hymenial surface pale gray to fawn, ascospores 40–50 × 1–2 µm, almost straight, aseptate; European species; Minter 1996a: 1) . . . . . ***C. juniperi***

5. On *Pinaceae* **6**

6. Paraphyses unbranched, straight, slightly swollen at the apex
(apothecia small, 0.6–1 × 0.28–0.4 mm, long ellipsoid, round or acute at each end, hymenial surface gray to dark gray, ascospores 33–53 × 2.5–3.5 µm, fili-fusiform, 3-septate at maturity; known only from China on dead or senescent twigs of *Pinus armandii;* Hou & Piepenbring 2005: 360) . . ***C. intermedium***

6. Paraphyses unbranched or branched, not swollen at the apex
(circinate or flexuous with hooked tips, apothecia larger than 1 mm) **7**

7. Apothecia with crenulate margin
(1–2 × 0.5–0.75 mm, ellipsoid, subglobose to irregularly oblong and flexuous, hymenial surface grayish blue to violaceus gray, ascospores 70–75 × 2 µm, almost straight, rounded apex and basal end acute, aseptate; known only from Sweden on fallen twigs of *Pinus sylvestris;* Saccardo 1891: 1128) . . ***C. serrulatum***

7. Apothecia with smooth, striate or rugose margin **8**

8. Paraphyses branched, circinate
(apothecia 1–4 × 0.7–1 mm, ellipsoid to linear, hymenial surface pale yellowish gray, ascospores 30–45 × 1.5–2 µm, aseptate; known only from USA on decorticated conifer wood; Sherwood 1979: 35) . . . . . ***C. deustum***

8. Paraphyses unbranched, flexuous with hooked tips **9**

9. Apothecia 0.7–3 × 0.4–1 mm, sometimes curved or irregularly branched, hymenial surface grayish to bluish gray (ascospores 26–42 × 1.5–2 µm, rod-shaped to filiform, aseptate; European species, growing on fallen twigs of *Picea abies;* Minter 1997: 1) . . . . . ***C. crispum***

9. Apothecia 2–3 mm long, oblong to linear, flexuous, black,
(ascospores 25–35 × 1–1.5 µm, subfiliform, rounded apex and acute base, aseptate; known only from Sweden, growing on bark of fallen twigs of *Picea abies;* Saccardo 1891: 1127) . . . . . ***C. pseudographioides***

10. Apothecia with milk white hymenial surface
(ascospores 50–75 µm long, filiform; known only from North America on dead branches of *Rhododendron groenlandicum;* Peck 1876: 69, Saccardo 1883: 804) ..... ***C. lacteum***

10. Apothecia with gray, bluish gray or grayish blue hymenial surface **11**

11. Paraphyses unbranched, straight to flexuous, apex not differentiated, apothecia small, ≤1.5 mm long **12**

11. Paraphyses unbranched or branched, coiled or convoluted at the apex, apothecia >2 mm **13**

12. Apothecia, 0.7–1.2 × 0.4–0.6 mm ellipsoid to almost circular
(paraphyses straight, ascospores 35–62 × 2–3 µm, fili-fusiform, tapering towards the base, aseptate; known only from China on dead or senescent twigs of *Rhododendron* sp.; Hou & Piepenbring 2005: 363) ..... ***C. sinense***

12. Apothecia 0.5–1.5 × 0.25–0.35 mm, oblong
(paraphyses straight to flexuous, ascospores 35–70 × 1.5–2 µm, filiform, straight to slightly curved, aseptate; known only from China on dead branches of *Rosa* sp.; Trotter 1972: 458 as *Lophodermium rosae* Teng) ..... ***C. rosae***

13. Apothecia small (0.5–5 × 0.4–1 mm)
(elliptical to oblong elliptical, aligned with the main axis of the substratum, ascospores 33–55 × 1–2 µm, almost straight, aseptate; European species, on dead attached twigs of *Rhododendron tomentosum;* Minter 1996b: 1) ..... ***C. ledi***

13. Apothecia much larger (30–35 × 2–3 mm)
(irregularly oblong, tubular, curved, sigmoid, sometimes also with bifurcations, ascospores 60–75 × 1–1.5 µm, slightly curved, aseptate; known only from Italy on dead attached twigs of *Castanea;* Medardi 2004: 36) ..... ***C. caesium***

14. On dead wood of conifers,
(apothecia ellipsoid, oblong to orbicular, white to gray in hymenial surface, ascospores 75–100 × 1.5 µm, filiform, only known from boreal America on *Picea mariana* and *Chamaecyparis thyoides;* Saccardo 1883: 803, Ellis & Everhart 1892: 723 as *Clithris morbida* (Pk.) Ellis & Everhart) ..... ***C. morbidum***

14. On angiosperms **15**

15. Paraphyses dichotomously to irregularly branched at the apex
(apothecia 2–10 × 0.4–0.8 mm, ellipsoid, oblong, fusiform, curved, sigmoid, lacrymoid, sinuous to undulate, round or acute at both ends, hymenial surface light yellow to deep yellow, on fallen and dead culms of *Guadua angustifolia* ..... ***C. guadueticola***

15. Paraphyses unbranched, circinate or coiled at the apex **16**

16. On *Fagaceae* and living/dead branches of *Quercus* spp.
(apothecia 2–15 × 0.5–3 mm, fusiform, navicular to curved, flexuous, hymenial surface yellow, greenish yellow to olivaceous yellow, ascospores 70–95 × 1–3 µm, slightly curved, multiseptate, paraphyses curled to coiled, hooked; European species; Saccardo 1883: 722, Dennis 1981: 226) .... ***C. quercinum***

16. On *Ericaceae* **17**

17. On dead bark of *Rhododendron periclymenoides*
(apothecia 1–3 mm long, linear to elongate, flexuous, hymenial surface dark red, ascospores 90 × 2 µm, filiform, aseptate).
Known only from boreal America (Cooke 1889: 58, Saccardo 1891: 1128, Ellis & Everhart 1892: 722 as *Clithris*) ..... ***C. azaleae***

17. On fallen dead twigs of *Vaccinium myrtilloides*
(apothecia 1–2 × 0.6–1 mm, elongate, hymenial surface translucent yellowish green, ascospores 64–91 × 2–3 µm, sigmoid, attenuated base, 7–8 septate).
Known only from Austria (Remler 1980: 173) ..... ***C. styriacum***

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